1.12 Input Devices:

- The device that is used to feed data into a computer is called input device.
- It sends data into the CPU after converting it into binary codes.
- Some commonly used input devices are: keyboard, mouse, scanner, touch screen, light pen etc.

1. Keyboard:

- It is the primary or standard input device of any computer system.
- It operates by converting key presses to electronic signals in binary digital form.

- The keys on computer keyboards are often classified as follows:

  a) Alphanumeric keys: These include letters and numbers.

  b) Punctuation keys: These include comma,semicolon etc.

  c) Special keys: These include function keys(F1 to F12), control keys, arrow keys etc.

2. Mouse:

- It is an input device that controls the movement of the cursor or pointer on a display screen.
- It is used to perform various functions such as opening a program or file and does not require the user to memorize commands.
- There are three basic types of mouse namely mechanical, optomechanical and optical.

a) Mechanical mouse:

- It has a rubber or metal ball on its underside that can roll in all directions.
- Mechanical sensors within the mouse detect the direction the ball is rolling and move the screen pointer accordingly.

b) Optomechanical mouse:

- It is same as the mechanical mouse except that the sensors used in it are optical and not mechanical.

- This mouse is more accurate than a mechanical mouse but is not as good as an optical mouse.

c) Optical mouse:

- It uses a laser light to detect the mouse's movement and has no mechanical moving parts.
- This mouse respond more quickly and precisely than mechanical and optomechanical mouse, but are little expensive.

3. Touch Panel:

- A touch panel or touch screen is an input device that lets users interact with a computer by touching the screen directly.
- They are common in devices such as personal computers, electronic voting machines, smartphones etc.

4. Light Pen:

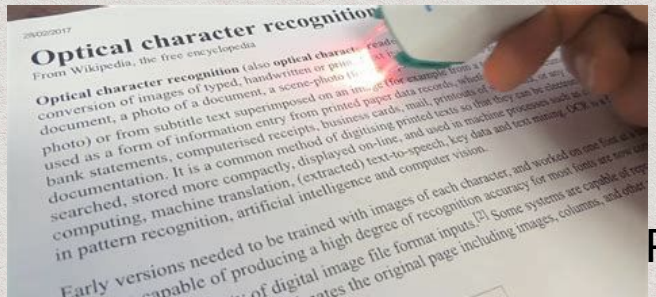
- It is an input device used for pointing or selecting the objects in the screen with greater positional accuracy.
- It is generally used for drawing and in computer aided design (CAD).

5. Scanners:

- They are used to input images or text printed on a paper into a computer, allowing the computer to read or display the scanned object.
- Commonly used optical scanners are: OCR, OBCR and OMR. (Flatbed Scanners)

a) Optical Character Reader (OCR):

- They are used to scan special characters such as alphabetic and numeric characters printed on the paper using light source.
- An OCR system enables us to take a book, scan it into a computer file, and then edit using a word processor.



b) Optical Bar-Code Reader (OBCR):

- It uses a number of bars (lines) of varying thickness and spacing between them to indicate the desired information.
- The bar-code is decoded and data are sent to the computer where the name of the item, its price and other necessary information are printed. (QR codes are best read by 2D barcode scanners.)

c) Optical Mark Reader (OMR):

- It is a device that reads pencil marks on multiple choice question answer sheets or other documents in similar form.
- OMR allows for the processing of hundreds or thousands of documents per hour.
- If filled space in the form is not filled completely,OMR may be unable to read marks accurately.

6. Touch Pad:

- It is an input device on laptops to move a cursor with our finger.
- As we move our finger on the surface, the mouse moves in that same direction and can be used in place of an external mouse.

7. Microphone:

- It is an input device used to input sound that is then stored in digital form.
- It is used to record a voice or music (ADC ckt) and play back later (DAC ckt).

8. Digital Camera:

- It is an input device that takes pictures or videos and can also store the image as data.
- A camera that is always connected to our laptop with no storage can be referred as digital camera or simply webcam.

Uses of Input Devices:

- To feed data and programs into computer system.
- To interact with computer system by providing commands by selecting and clicking on buttons and menus.
- To control the operation of computer system.

1.13 Output Devices:

- Any peripheral device that receives and displays output of a computer to the outside world is called output device.
- Output devices are responsible for converting output in binary form to human understandable form.
- Broadly output devices can be divided into two categories: Soft Copy and Hard Copy output devices.
- Soft copy is an electronic display of digital information such as files,this presentation, word document viewed on the PC monitor.
- Examples of output devices that generate soft copy output are monitor, speaker etc.
- Once soft copy is printed, they are referred to as hard copy.
- Examples of output devices that generate hard copy output are printer, plotter etc.

1. Monitor:

- It is used to display information, programs and applications in a computer.
- It is also called primary output device or standard output device.
- Different types of monitors are: CRT Monitor, LCD Monitor, LED Monitor and Plasma Display Panel.

a) CRT Monitor:

- It is a technology used in early monitors.
- It uses a beam of electrons to create an image on the screen.
- It comprises the guns(3-RGB) that fire a beam of electrons inside the screen.
- The electron beams repeatedly hit the surface of the screen.
- These guns are responsible for generating RGB (Red, Green, Blue) colors, and more other colors can be generated with the help of combining these three colors.

b) LCD Monitor:

- LCD(Liquid Crystal Display) screen contains a substance known as liquid crystal.
- The particles of this substance are aligned in a way that the light located backside on the screens allow to generate an image or block.
- They consumes less power(app. 40watt) than CRT monitors(app. 100watt).

c) LED Monitor:

- LED stands for Light Emitting Diode and it is a type of flat panel display that uses an array of light emitting diodes as pixels for a video display.
- They are less expensive, posses more quality and have longer life than LCD monitors.

d) Plasma Display Panel (PDP):

- It is a computer video display in which each pixel on the screen is illuminated by a tiny bit of plasma or charged gas(Neon).
- They are thinner than CRT displays and brighter than LCD display.

2. Printers:

- It is an external hardware device that generates hard copy of the computer data on paper.
- They are one of the mostly used peripherals on computers and are commonly used to print text, images etc.
- There are two basic qualities associated with printers: resolution and print speed.
- Print resolution is measured as the number of dots per inch (dpi) (Higher resolution means higher detail).
- Print speed is measured in pages per minute (ppm).
- Some common types of printers are: impact printer and non-impact printer.

a) Impact Printer:

- Impact printer prints characters or images by **striking(paper)** print hammer against an inked ribbon and prints on the paper (paper in between them).
- It prints documents at slower rate and produces noise while printing.
- It includes dot-matrix printer and line printer.

i) Dot-matrix Printer:

- It creates characters by striking pins against an inked ribbon; each pin makes a dot and combination of dots form characters and illustrations.
- They are relatively expensive and do not produce high-quality output.
- They are rarely used because of the low quality print.

ii) Line Printer:

- It is high speed printer capable of printing an entire line of text at one time.
- A fast line printer can print as many as 3,000 lines per minute.
- The disadvantages of line printers are that they can't print graphics, the print quality is low and they are very noisy.
- The line printers are of two types: Drum printers and Chain printers.

b) Non-impact Printer:

- Non-impact printer prints characters and images **without striking** the papers.
- These printers can print documents at faster rate and also do not produce noise while printing.
- It includes ink-jet printer, laser printer and thermal printer.

i) Ink-jet Printer:

- It works by spraying ionized ink(electrically charged) on a sheet of paper.
- They are capable of producing high quality print.
- The price of ink-jet printers is lower than that of laser printers.
- They are considerably slower and they require a special type of ink(dye-based ink).

ii) Laser Printer:

- It utilizes laser beam to produce image on a drum via reflection from mirror.
- The light of laser alters the electrical charge on the drum wherever it hits.
- The drum is then rolled through a reservoir of toner(powder) and finally the toner is transferred to the paper through a combination of heat and pressure.
- This is the way copy machines work and they are sometimes called page printers.
- Output quality of laser printer is better than ink-jet printers and dot-matrix printers.

iii) Thermal Printer:

- It produces a printed image by selectively heating coated thermal paper(change color when exposed to heat) when the paper passes over the thermal print head.
- The coating turns into appropriate color in the areas where it is heated, producing an image.
- The printer sends an electric current to the heating elements of the thermal head and the heat activates the thermo-sensitive coloring layer of the thermo-sensitive paper, which changes color where heated.

Difference between Impact and Non-impact Printer

Impact Printer	Non-impact Printer
1. It prints characters or images by striking print hammer against an inked ribbon.	1. It prints characters and images without striking the papers.
2. Its speed is slower.	2. Its speed is faster.
3. Its printing quality is lower.	3. Its printing quality is higher.
4. It generates noise during printing.	4. It does not generate noise during printing.
5. It uses inked ribbon for printing.	5. It uses toner or cartridge for painting.
6. It is less expensive.	6. It is more expensive.
7. Dot matrix is an impact printer.	7. Laser printer is a non-impact printer.

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3. Plotters:

- It is a computer hardware device much like a printer that is used for printing vector graphics.
- They use a pen, pencil, marker, or another writing tool to draw multiple, continuous lines onto paper.
- Plotters were the first type of printer that could print with color and render graphics and full-size engineering drawings.
- They are much more expensive than printers.
- They are mostly used for CAE (Computer Aided Engineering), CAD (Computer Aided Design) etc.

4. Speaker:

- It is a hardware device that connects to a computer to generate sound.
- They can be built into the computer or can be attached separately.
- They are made up of a cone, an iron coil, a magnet and housing.
- When speaker receives electrical input from a device, it sends the current through the coil to move it back and forth.
- This motion then vibrates the outer cone generating sound waves.

Importance of Output Devices:

- To provide result of processing to users
- To relay information to other devices